

First record of *Ceriagrion fallax* Ris (Odonata: Coenagrionidae) preying on small web-building spiders (Arachnida: Tetragnathidae)

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In montane forest of south-western Yunnan, China, a female of *Ceriagrion fallax* was observed and photographed preying on a small web-building spider of the genus *Leucauge*. This is the first record of plucking an orb-weaver spider by a representative of the genus *Ceriagrion*. A brief discussion on the evolution of spider feeding behaviour in odonates is provided.

Keywords: Odonata; Zygoptera; Coenagrionidae; *Ceriagrion fallax*; predation; *Leucauge*

Introduction

Many species of Odonata have been reported preying on small web-building spiders, as was related by Novelo-Gutiérrez and Ramírez (2013). After reading the interesting record of Novelo-Gutiérrez and Ramírez (2013), I recalled observing a similar event during my own fieldwork in which a little damselfly, *Ceriagrion fallax* Ris (Coenagrionidae), also caught a web-building spider as prey. Fortunately, I recorded the episode in detail in my fieldwork diary which I describe here. According to Dijkstra, Kalkman, Dow, Stokvis, and van Tol (2014), *Ceriagrion* is closely related to *Telebasis* (the temporary spider feeding specialist, according to Novelo-Gutiérrez & Ramírez, 2013) and pseudostigmatids (the obligatory spider feeding group). However there has so far been no report of *Ceriagrion* species preying on spiders. I suppose this observation should be a temporary specialization (Corbet, 1999).

Observations

During fieldwork in Tengchong, Yunnan, China, on 14 August 2006, I observed one female of *Ceriagrion fallax* Ris (Coenagrionidae) suddenly lift out of bushes nearby (indeed I would not have noticed her without this unexpected movement) and rush down to catch something below. Then she moved a little distance (about 1 m) away and rested on a leaf of *Ageratina adenophora* (Asteraceae) with a clumsy posture, to consume her prey (Figure 1). This aberrant behaviour attracted me to take a closer look. The female was so concentrated on eating that she

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Figure 1. A female *Ceriagrion fallax* consuming a *Leucauge* sp. on the leaf of *Ageratina adenophora* in montane of Tengchong, Yunnan.



Figure 2. The same female *Ceriagrion fallax* and remains of the *Leucauge* sp. in a sweep net.

did not notice me at such a close distance (within 50 cm). This offered me a good chance to take photos with a digital camera (Canon Power Shot S1 IS). It was a small green-coloured *Leucauge* sp. (Tetragnathidae) that the female *C. fallax* was consuming. In order to identify the species I caught both the damselfly and spider with a sweep net (Figure 2). I also found the empty web where the spider used to rest. It was about 10 am and the weather was good. The mountain was covered with dense trees. However the place where I made the observation was relatively open with bright sunshine. *A. adenophora*, a notorious invasive plant in China, occupied almost all the area where a little stream ran through in a zigzag. Very few insects occur in the *A. adenophora* community. Web-building spiders, however, were abundant here, especially on the sides of the stream.

Discussion

Both *Ceriagrion fallax* and *Leucauge* are common in South China. I have found large numbers of both of them occurring sympatrically in Guangxi, Zhejiang, Sichuan, etc., especially in some rice fields. But predation behaviour similar to that described here has never been found before. It seems very likely, then, that this is a case of temporary specialization, as suggested by Novelo-Gutiérrez and Ramírez (2013) for *Telebasis filiola*. The putative reason is that the usual small insect prey species of *C. fallax* are probably present in relatively low numbers in a field covered with *A. adenophora*, as compared, for example, to a rice field. In recent decades *A. adenophora* has greatly damaged ecological systems in south China, especially in Yunnan. It leads to the extinction of many local plants. Few local animals and insects can feed on this exotic plant. Water may be an even more important ecological limiting factor for *C. fallax* in this area. Thus, in response to the limited food resources, *C. fallax*, a typical opportunistic predator (Corbet, 1999), may become a temporary specialist. Just as *Ischnura elegans* is prevalent in the Palaearctic realm, *C. fallax* is ubiquitous in south China. The females, especially, are efficient and successful predators who will attack any living things smaller than or equal to their own size. I have observed female *C. fallax* preying on *Ischnura rufostigma*, *I. senegalensis*, *Acigrion migratum*, *Agriocnemis femina* and even males of their own species. Novelo-Gutiérrez and Ramírez (2013) mention that *I. elegans* can perform all the three strategies of preying on spiders, namely plucking spiders from leaves, attempting to steal insects trapped in spider webs, and gleaning spiders from orb-webs. *C. fallax* could arguably have the same behaviours as *I. elegans* since both have a similar niche.

The close relationship between *Ceriagrion* and Pseudostigmatidae has been confirmed (Carle, Kjer, & May, 2008; Dijkstra et al., 2014; Dumont, Vierstraete, & Vanfleteren, 2010). I agree with Ingleby, Bybee, Tennessen, Whiting, and Branham (2012) that “opportunistic feeding may represent behavioural stepping-stones towards the apparent obligatory spider feeding observed in Pseudostigmatidae”. However their hypothesis that “feeding on dead web-trapped insects is a secondary adaptation to spider feeding” may need more exploration. I observed *I. elegans* sometimes seeking among leaves of lotus in a pond and suddenly rushing down to catch a small item (a piece of a branch, a dry straw, and even a grain of sand) on a leaf floating on the water surface. Then, they drop it immediately when perceiving it is not food. How they recognize non-food items is unclear. In another case, a female *Platycnemis phyllopoda* Djakonov resting on a weed 20–25 cm above the ground, sometimes patrolled around and suddenly rushed down to the ground to collect similar small items. Like the observed *I. elegans* she dropped her “prey” immediately. Although both *I. elegans* and *P. phyllopoda* are more sensitive to moving targets generally, these two examples, along with others noted above, imply that gleaning for unmoving targets (including spiders and dead web-trapped insects) may be not uncommon, at least in coenagrionoids. Compared to obligatory spider feeding this behaviour should be considered a plesiomorphic feature.

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References

- Carle, F. L., Kjer, K. M., & May, M. L. (2008). Evolution of Odonata, with special reference to Coenagrionoidea (Zygoptera). *Arthropod Systematics & Phylogeny*, 66, 37–44. Retrieved from http://www.senckenberg.de/files/content/forschung/publikationen/arthropodsystematics/asp_66_1/66_1_carle_37-44.pdf

- Corbet, P. S. (1999). *Dragonflies. Behavior and ecology of Odonata*. Ithaca: Cornell University Press.
- Dijkstra, K.-D. B., Kalkman, V. J., Dow, R. A., Stokvis, F. R., & van Tol, J. (2014). Redefining the damselfly families: the first comprehensive molecular phylogeny of Zygoptera (Odonata). *Systematic Entomology*, 39, 68–96. doi:10.1111/syen.12035
- Dumont, H. J., Vierstraete, A., & Vanfleteren, J. R. (2010). A molecular phylogeny of the Odonata (Insecta). *Systematic Entomology*, 35, 6–18.
- Ingle, S. J., Bybee, S. M., Tennessen, K. J., Whiting, M. F., & Branham, M. A. (2012). Life on the fly: Phylogenetics and evolution of the helicopter damselflies (Odonata: Pseudostigmatidae). *Zoologica Scripta*, 41, 637–650. doi:10.1111/j.1463-6409.2012.00555.x
- Novelo-Gutiérrez, R., & Ramírez, A. (2013). First record of *Telebasis filiola* Perty (Odonata: Coenagrionidae) preying on small web-building spiders (Arachnida: Tetragnathidae). *International Journal of Odonatology*, 16, 289–292. Retrieved from <http://dx.doi.org/10.1080/13887890.2013.830992>